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Quality Engineering Test Report

MODEL : QP-375-5A 378 W

AC-DC QUAD OUTPUT SWITCHING POWER SUPPLY

V1 : +5 V/ 30 A V2 : +12 V/ 10 A

V3 : 12 V/ 6 A V4 : 12 V/ 3 A

(1) INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	86 VAC~ 264 VAC (Typ)	I/P:TESTING O/P:FULL LOAD Ta:25°C	61 V~ 264 V	P
			I/P: LOW-LINE-3V= 82 V HIGH-LINE+15%= 300 V O/P:FULL/MIN LOAD ON: 1 Sec. OFF: 5 Sec. 300 TIMES (AC POWER ON/OFF)	TEST: OK	
2	INPUT FREQUENCY RANGE	47 HZ ~ 63 HZ(Typ) NO DAMAGE OSC	I/P: 115 VAC ~ 264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK	P
3	INPUT CURRENT	230V/ 3 A(Max) 115V/ 6 A(Max)	I/P: 230 / 115 VAC O/P:FULL LOAD	I = 2.18 A/ 230 VAC I = 4.4 A/ 115 VAC	P
4	INRUSH CURRENT	230 V/ 45 A(Max) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	I = 28 A/ 230 VAC	P
5	LINE REGULATION	V1: +0.5 %~ -0.5 %(Max) V2: +0.5 %~ -0.5 %(Max) V3: +0.5 %~ -0.5 %(Max) V4: +0.5 %~ -0.5 %(Max)	I/P: 264 VAC ~ 115 VAC O/P:FULL LOAD Ta:25°C	V1: 0 %~ 0 % V2: 0 %~ 0 % V3: +0.05 %~ -0.05 % V4: +0.05 %~ -0.05 %	P
6	EFFICIENCY	77 %(Typ)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	79.56 %	P
7	POWER FACTOR	230 V/ 0.95 (Typ) 115 V/ 0.98 (Typ)	I/P: 230 / 115 VAC O/P:FULL LOAD Ta:25°C	PF= 0.97 / 230 VAC PF= 0.99 / 115 VAC	P

(2) OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	SET UP TIME	230 VAC/ 800 ms(Max) ---- VAC/ ---- ms(Max)	I/P: 230 / 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 135 ms 115VAC/ 155 ms	P
2	RISE TIME	230VAC/ 50 ms(Max) ---- VAC/ ---- ms(Max)	I/P: 230 / 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 14 ms 115VAC/ 16 ms	P
3	HOLD UP TIME	230VAC/ 20 ms(Max) 115VAC/ 20 ms(Max)	I/P: 230 / 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 30 ms 115VAC/ 30 ms	P
4	OVER/UNDERSHOOT TEST	< ±5%(Max)	I/P: 230 / 115 VAC O/P:FULL LOAD Ta:25°C	TEST: <5%	P

5	OUTPUT VOLTAGE ADJUST RANGE	CH1: <u>+10 %</u> ~ <u>-5 %</u> (TYP) CH2: <u>+10 %</u> ~ <u>-5 %</u> (TYP) CH3: <u>+10 %</u> ~ <u>-5 %</u> (TYP) CH4: <u>+10 %</u> ~ <u>-5 %</u> (TYP)	I/P: <u>230 VAC</u> O/P:MIN LOAD Ta:25°C	V1: <u>+21 %</u> ~ <u>-13 %</u> V2: <u>+14 %</u> ~ <u>-13 %</u> V3: <u>+16 %</u> ~ <u>-14 %</u> V4: <u>+21 %</u> ~ <u>-16 %</u>	P
			I/P: <u>85 VAC</u> O/P:FULL LOAD (AC Turn ON/OFF in Vout Hi/Low Limit)	NO Damage	P
6	LOAD REGULATION	V1: <u>+0.8 %</u> ~ <u>-0.8 %</u> (Max) V2: <u>+0.8 %</u> ~ <u>-0.8 %</u> (Max) V3: <u>+0.8 %</u> ~ <u>-0.8 %</u> (Max) V4: <u>+0.8 %</u> ~ <u>-0.8 %</u> (Max)	I/P: <u>230 VAC</u> O/P:FULL ~MIN LOAD Ta:25°C	V1: <u>+0.3 %</u> ~ <u>-0.3 %</u> V2: <u>+0.05 %</u> ~ <u>-0.05 %</u> V3: <u>+0.25 %</u> ~ <u>-0.15 %</u> V4: <u>+0.4 %</u> ~ <u>-0.3 %</u>	P
7	OUTPUT VOLTAGE TOLERANCE	V1: <u>+1 %</u> ~ <u>-1 %</u> (Max) V2: <u>+1 %</u> ~ <u>-1 %</u> (Max) V3: <u>+1 %</u> ~ <u>-1 %</u> (Max) V4: <u>+1 %</u> ~ <u>-1 %</u> (Max)	I/P: <u>264 VAC</u> ~ <u>115 VAC</u> O/P:FULL/ <u>Min %</u> LOAD Ta:25°C	V1: <u>+0.49 %</u> ~ <u>-0.25 %</u> V2: <u>+0.05 %</u> ~ <u>-0.05 %</u> V3: <u>+0.31 %</u> ~ <u>-0.15 %</u> V4: <u>+0.5 %</u> ~ <u>-0.3 %</u>	P
8	RIPPLE & NOISE	V1: <u>100 mVp-p</u> (Typ) V2: <u>150 mVp-p</u> (Typ) V3: <u>150 mVp-p</u> (Typ) V4: <u>50mVp-p</u> (Typ)	I/P: <u>230 VAC</u> O/P:FULL LOAD Ta:25°C	V1: <u>19 mVp-p</u> V2: <u>10 mVp-p</u> V3: <u>9 mVp-p</u> V4: <u>14 mVp-p</u>	P
9	DYNAMIC LOAD	CH1: <u>1000 mVp-p</u>	I/P: <u>230 VAC</u> O/P:FULL / Min LOAD 90% DUTY/1KHZ Ta:25°C	<u>331 mVp-p</u>	P

(3) PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER VOLTAGE PROTECTION	CH1: <u>5.75 V</u> ~ <u>6.75 V</u> (Typ)	I/P: <u>230 / 115 VAC</u> O/P:MIN LOAD Ta:25°C	<u>6.56 V</u> / <u>230 VAC</u> <u>6.55 V</u> / <u>115 VAC</u> Shunt down -Repower ON	P
2	OVER LOAD PROTECTION	<u>105 %</u> ~ <u>135 %</u> (Typ)	I/P: <u>230 VAC</u> O/P:TESTING Ta:25°C	<u>114 %</u> / <u>230 VAC</u> Pulse by pulse	P
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: <u>264 VAC</u> O/P: <u>100% LOAD</u> Ta:25°C	NO DAMAGE Pulse by pulse	P
4	OVER TEMPERATURE PROTECTION	SPEC:Ta > <u>80 °C</u> .O.T.P. NO DAMAGE	I/P: <u>230 VAC</u> O/P:FULL LOAD	<u>82 °C</u> / <u>230VAC</u> <u>O.T.P. Active</u> * Shunt down -Repower ON	P

(4) CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	REMOTE CONTROL	<u>0 V~ 0.8V</u> POWER ON <u>4 V~ 10 V</u> POWER OFF	I/P: <u>230 VAC</u> O/P:FULL LOAD Ta:25°C	<u><2.84 V</u> POWER ON <u>>2.84 V</u> POWER OFF	P
2	POWER GOOD SIGNAL	DELAY 10ms ~ 500ms	I/P: <u>230 VAC</u> O/P:FULL LOAD Ta:25°C	<u>53 ms/ 230VAC</u> <u>53 ms/ 115VAC</u>	P
3	POWER FAIL SIGNAL	> 1ms	I/P: <u>230 VAC</u> O/P:FULL LOAD Ta:25°C	<u>12 ms/ 230VAC</u> <u>12 ms/ 115VAC</u>	P

(5) SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P: <u>3K VAC/min</u> I/P-FG: <u>1.5 KVAC/min</u> O/P-FG: <u>0.5 KVAC/min</u>	I/P-O/P: <u>3.6 KVAC/min</u> I/P-FG: <u>1.8 KVAC/min</u> O/P-FG: <u>0.6 KVAC/min</u> Ta:25°C	I/P-O/P: <u>9.6 mA</u> I/P-FG: <u>8.4 mA</u> O/P-FG: <u>8.8 mA</u> NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P:500VDC >100M ohms I/P-FG:500VDC >100M ohms O/P-FG:500VDC >100M ohms	I/P-O/P: <u>500 VDC</u> I/P-FG: <u>500 VDC</u> O/P-FG: <u>500 VDC</u> Ta:25°C	I/P-O/P: <u>1.2G ohms</u> I/P-FG: <u>1.6G ohms</u> O/P-FG: <u>1.3G ohms</u> NO DAMAGE	P
3	LEAKAGE CURRENT	< <u>2 mA</u> /240VAC	I/P:(240VAC)*1.06/ (60HZ) O/P:Min LOAD Ta:25°C	L-FG: <u>1.5 mA</u> N-FG: <u>1.48 mA</u>	P
4	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < <u>100 m</u> ohms	<u>30 A</u> / 2min Ta:25°C	<u>32 m ohms</u>	P
5	APPROVAL	TUV:Certificate NO:R50014021 UL:File No:E183223			

(6) E.M.C TEST

NO	TEST ITEM	TEST CONDITION	SPECIFICATION	RESULT	VERDICT
1	HARMONIC	IEC61000-3-2 *CLASS A	I/P: <u>230VAC/50HZ</u> O/P:FULL LOAD Ta:25°C	*PASS	P
2	CONDUCTION	EN55022 *CLASS B	I/P: <u>230VAC (50HZ)</u> O/P:FULL/50% LOAD Ta:25°C	*PASS Under Test by certified Lab	P
3	RADIATION	EN55022 *CLASS B	I/P: <u>230VAC (50HZ)</u> O/P:FULL/50% LOAD Ta:25°C	*PASS Under Test by certified Lab	P
4	E.S.D	IEC61000-4-2 * LIGHT INDUSTRY AIR:8KV / Contac:4KV	I/P: <u>230VAC/50HZ</u> O/P:FULL LOAD Ta:25°C	*CRITERIA A	P
		IEC61000-4-4	I/P: <u>230VAC/50HZ</u>		

5	E.F.T	INDUSTRY INPUT:2KV	O/P:FULL LOAD Ta:25°C	* CRITERIA A	P
6	SURGE	IEC61000-4-5 * INDUSTRY L-N:2KV L,N-PE:4KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	* CRITERIA A	P

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(7) ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT		
1	TEMPERATURE RISE TEST T rise OF PARTS	MODEL:QP375-5A 1.ROOM AMBIENT BURN-IN: <u>2</u> HRS I/P: <u>230</u> VAC O/P: <u>100%</u> LOAD Ta= <u>24.4</u> °C 2.HIGH AMBIENT BURN-IN: <u>16</u> HRS I/P: <u>230</u> VAC O/P: <u>100%</u> LOAD Ta= <u>44.9</u> °C			P		
		NO	Position	P/N		TEMP Ta= <u>24.4</u> °C	TEMP Ta= <u>44.9</u> °C
		1	D1	SMD 3A/600V		31.3	48.7
		2	D60	1N5406 3A/600V		63.0	82.5
		3	BD1	KBJ608G 6A/800V		36.6	54.6
		4	L1	TR-288		35.7	53.3
		5	U2	ML 4800CP		28.1	45.9
		6	Q1	IRFP460 20A/500V		46.4	66.1
		7	Q2	IRFR460 15A/500V		44.0	64.4
		8	D3	RHRP1560 15A/600V		58.6	79.3
		9	Q5	2SK2652 6A/900V		53.2	74.1
		10	Q4	2SK2652 6A/900V		63	84.1
		11	TRC1	BT A16-600B/6A		45.7	64.2
		12	TSW1	S7-22 80°C		46.1	65.8
		13	C5	470u/400V 85°C		36.0	53.2
		14	T1core	TF826		56.3	74.9
		15	T1coil	TF826		68.8	88.3
		2	OVER LOAD BURN-IN TEST	NO DAMAGE 1.5 HOUR (MIN)		I/P: <u>230</u> VAC O/P: <u>114</u> % Ta:25°C	TEST: <u>OK</u>
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER <u>2.5</u> HOUR	I/P: <u>230</u> VAC O/P: <u>100</u> %LOAD Ta= <u>-11.5</u> °C	TEST: <u>OK</u>	P		
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER <u>12</u> HOURS IN CHAMBER ON CONTROL <u>55</u> °C NO DAMAGE	I/P: <u>230</u> VAC O/P:FULL LOAD Ta= <u>55</u> °C HUMIDITY= <u>95</u> %R.H	TEST: <u>OK</u>	P		
5	TEMPERATURE COEFFICIENT	<u>± 0.03</u> %(0~50°C)	I/P: <u>230</u> VAC O/P:FULL LOAD	<u>+ 0.01</u> %(0~50°C)	P		

(8) M.T.B.F & LIFE CYCLE CALCULATION

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NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	SUPPOSE C <u>111</u> IS THE MOST CRITICAL COMPONENT I/P:230 VAC O/P:FULL LOAD Ta= <u>25</u> °C LIFE TIME= <u>224553</u> HRS I/P:230 VAC O/P:FULL LOAD Ta= <u>45</u> °C LIFE TIME= <u>61036</u> HRS			P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE: <u>75931</u> HRS			P

(9) VIBRATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	VIBRATION TEST	1 Carton & 1Set Operating at I/P:230VAC no load (1) Waveform: Sine Wave (2) Frequency:10~500Hz (3) Sweep Time:10min/sweep cycle (4) Acceleration:2G (5) Test Time:1 hour in each axis (X.Y.Z) Ta:25°C	TEST: ----		N/A

(10) COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q <u>5</u> Rated <u>2SK2652</u> : <u>900</u> V <u>6</u> A	I/P:High-Line +3V = <u>267</u> V O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C	(1) <u>744</u> V (2) <u>816</u> V (3) <u>876</u> V	P
2	Diode Peak Voltage	D <u>102</u> Rated <u>S30SC4M</u> : <u>40</u> V <u>30</u> A	I/P:High-Line +3V = <u>267</u> V O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C	(1) <u>16.1</u> V (2) <u>22.5</u> V (3) <u>22.7</u> V	P

DATE	SAMPLE	TEST RESULT	TEST	APPROVAL
2003/7/18	ENGINEERING SAMPLE	PASS	Vincent Tseng	Max Lin
2003/9/19	PRODUCTION SAMPLE A210A14	PASS	Vincent Tseng	Max Lin
2004/3/31	PRODUCTION SAMPLE A301B24	PASS	Vincent Tseng	Max Lin